X-Ray Diagnosis and Therapy in Arthritis

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SATISFACTORY diagnosis of the arthritides is frequently difficult except by roentgenographic study of skeletal structures. The late S. Gilbert Scott of London in his monograph on the rotengenological examination of the hands in the arthritides dubbed the hand "the calling card of the arthritic patient." In his book he stated that in systemic forms of arthritis the hand is usually involved even though there may be no subjective findings locally.

Four main types of arthritic or rheumatic conditions are seen by physicians with much greater frequency than are other types. They are the following:

1. Osteo-arthritis (synonyms: Degenerative arthritis, hypertrophic arthritis). This form of arthritis affects both males and females, principally in the latter half of life, and in all climes.

In the hands the distal joints of the fingers appear nodular (Heberden's nodes), and sometimes the distal phalanx is tipped slightly to one side. The roentgenogram reveals narrowing of the cartilages of the joints involved. The involvement is usually bilateral. There may be associated similar involvement of the proximal interphalangeal joints. The articular ends of the bones become broadened and show a tendency toward proliferative bony changes at the periphery of the articular surfaces. The involved joints in the more advanced stages may also show a hill and valley grooving of the badly worn articular ends of the bones. The other joints of the hand and wrist are rarely involved. A very important feature is the normal bone density present. No osteoporosis is present in osteo-arthritis. This type of arthritis is degenerative and is the type also found associated with occupational traumata.

2. Rheumatoid (also called proliferative or atrophic) arthritis is quite a different problem, not only clinically but also roentgenographically. It is found more frequently in women of child bearing age and in emotionally unstable people. It is sometimes found in males. It is not a degenerative disease but is an acute or subacute illness which may be devastating to a few or many of the joints of the body. It is usually found in the joints of the extremities, but it may involve the spine and/or the shoulder and hip girdles.

In the hands there is destruction of the cartilages of the proximal joints of the fingers, the metacarpophalangeal joints, and the carpal regions, and there is fusiform soft tissue swelling about the proximal joints of the fingers. The distal joints of the fingers are uninvolved. It is usually bilateral and in more advanced cases there is frequently ulnar deviation of the fingers. There is a definite tendency, sometimes quite marked, toward osteoporosis. No new bone is laid down about the joints but there is usually considerable soft tissue proliferation or swelling about the involved joints, hence the term proliferative arthritis. The hands usually feel cold and clammy. When rheumatoid arthritis involves the spine, the joints of the extremities usually escape, and, conversely, when it involves the extremities, the spine usually escapes. The cause of this geographic variation is not understood.

In some cases the first evidence of disease in the back is found in the sacro-iliac joints. When this occurs the first roentgenographic evidence of disease is a loss of sharp definition of the outlines of a part of or all the articular surfaces of one or both of the sacro-iliac joints. As the condition progresses more and more of the definition of the joint is lost until finally the entire articulation takes on a blurred appearance. Later, in rheumatoid arthritis, actual bony ankylosis occurs. Clinically the patients usually have tenderness over the sacro-iliac joints. The degree of tenderness varies widely. Recurrent attacks of low back pain are usual phenomena. (Rheumatoid spondylitis will be discussed later in this paper.)

3. Gout. Only 32 per cent of persons with gouty arthritis show bone changes in the roentgenogram, even in the late stages of the disease. When signs are present on roentgenograms, there are definite punched-out appearing areas in the subchondral bone at the heads or bases of the long bones of the hands or feet. This may be so advanced as to cause destruction of the articular surfaces of one or many joints. Gouty arthritis may be either unilateral or bilateral. In 70 per cent of cases the first attack appears in the metatarso-phalangeal articulation of the great toe, and it may appear in this region and not in any other location.

Gout does not always show bilateral distribution in the roentgenograms. However, many cases of gout are not associated with roentgenographic evidence of the disease until late. Gout is much more frequent in males but may be found in either sex after adulthood. It is more frequently found after middle age. It is more destructive when found in young people. The uric acid content of the blood is elevated in about 75 per cent of cases. The disease is sometimes found in people who drink no alcoholic beverages and who live on a simple diet.

4. Non-articular or soft tissue rheumatism causes no bony changes other than occasional inflammatory roughening of the periosteum of the long bones. It is frequently associated with capsulitis and pericapsulitis, as well as inflammation of the sheaths of the tendons. There is evidence of inflammation of the fibrous tissue in the muscles, as was observed by F. F. Roynd. This is frequently fleeting in character and tends toward spontaneous remission in its earlier phases. Later it may be constant and, when chronic, is usually associated with arthritic changes in the joints. It may be as painful as any of the arthritides.

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RADIATION THERAPY

Roentgen ray therapy locally over inflamed joints may be used to relieve pain. In this capacity it may be used in osteoarthritis, rheumatoid arthritis, gouty arthritis, or in cases of capsulitis, pericapsulitis, bursitis, or tendinitis. It is quite dramatic in the relief of the intense pain sometimes associated with capsular or pericapsular inflammation, usually three or four treatments sufficing to relieve the pain and reduce the immobility of the joint. In sciatic neuritis, the results of roentgen ray therapy are only partially satisfactory, particularly in acute cases.

All forms of heat treatment make the skin more sensitive to roentgen rays. Hence it is well to avoid such treatment for at least a week before and a week after roentgen radiation has been given. This includes diathermy, hot air, light, short-wave therapy, ointment dressings, plasters, hot packs, etc. Luetics, even when in a symptomless stage, tend toward a stronger skin reaction than other patients.

In advanced osteoarthritic changes in the lumbar region, considerable relief frequently follows radiation of the lumbar muscles. This has been well attested by Kahlmeter in 1929 and again in 1937, by Von Pennewitz in 1933, and Scott in 1937, and by other writers. This is probably due to improvement in the circulation of these muscles and their aponeuroses; with radiation the muscle spasm is lessened. According to Scott, Kaplan, and others, roentgen rays improve circulation as well as increase lymphocytic activity.

Radiation therapy is also of some palliative value in advanced degenerative arthritis of the hip, the so-called malum coxae senilis. The relief appears to be largely due to relief of muscle spasm. Radiation therpay does not deter the degeneration of the joint.

The author's radiation technique is briefly, as follows: For the elbow, wrist, ankle, shoulder, hip, and knee, 100 to 150 r per treatment, the dose depending upon the size of the joint, treating twice weekly and employing, over the larger joints, two ports, an anterior and posterior, until four to eight treatments have been given. A second course of four treatments may be given after a rest period of from six to twelve weeks.

Spondylitis of the rheumatoid type, according to the late S. Gilbert Scott, usually begins as arthritis of the sacro-iliac joints; he described cases in which the first roentgenographic evidence of disease was in the sacro-iliac joints. In most of his cases he was able to elicit histories of growing pains through childhood and early adulthood. Furthermore, a considerable number of his patients had been athletes; quite a number of them had been excellent swimmers.

At least 90 per cent of ankylosing spondylitis occurs in men. According to Ehrlich the average age of onset is 31 years. It is not familial.

The disease usually begins with pains or aching in the lower back; frequently the first discomfort is a "lumbago-like" painful attack which comes and goes. Each occurrence is more painful and persistent than preceding ones. The soreness then extends out into the gluteal regions and up the back. Permanent stiffness, according to Crowe, usually occurs in from one to five years after the onset of rheumatoid spondylitis. During this period the patient loses weight, becomes easily fatigued, irritable and introspective.

Goldthwait and his co-workers, in their excellent monograph on body mechanics, describe the psysiologic changes resultant from this postural change. The chest is flattened and the posterior mediastinum is practically obliterated so that the diaphragmatic movements are seriously impaired and portal circulation is thereby greatly decreased.

The inflammatory changes in the soft tissues of the back are followed by calcification in the anterior, posterior and lateral ligaments of the spine as well as of the interspinous ligaments. The so-called bamboo spine is thus produced. It is also known as the Marie-Strumpell spine. With the calcification of these structures the mobility of both the spine and thoracic cage is lost and the patient thereafter stands in a kyphotic posture with the shoulders thrust forward, the chest flat and the lumbar curve largely lost. Lung expansion is much impaired. Though the end result is painless the condition does not burn itself out until the patient is a "burned out spondylitic wreck."

As to treatment, Scott and Kahlmeter are outspoken in their favor of roentgen ray therapy. Khalmeter stated in 1932 that "there are few fields in x-ray therapy in which the results are so reliable and satisfactory as they are in arthritis." This statement has been well borne out by the experience of Freiburg and many others.

Roentgen ray therapy for spondylitis is as follows: Radiation is given along the entire spine, using a port 10 cm. wide and radiating the entire spine by segments, not more than half the spine receiving radiation at one sitting. A dose of 75 r is given to each field twice weekly for three weeks. Following a rest period of two months, four to six treatments are given as a second course. The patient should then be watched for 12 months and if the condition tends to return, a third and shorter series may be given. Not more than 1,000 r should be given any one field. The clinical response is indeed gratifying. The crippling muscle spasm and pain is overcome and mobility of the spine, so far as muscle spasm is concerned, is restored. No other method of therapy for spondylitis offers the patient this degree of early and lasting relief.

Roentgen treatment for bursitis of joints is dramatic in suddeness of relief at times. For instance, in bursitis of the shoulder, in which the pain is sometimes agonizing, much relief may be experienced 12 to 24 hours after the first treatment. Our experience coincides with that of Young in that there is a higher percentage response in acute cases than in those of longer standing. Four treatments given either daily or at two-day intervals usually relieve the spasm and pain. It is well to take a roentgenogram of the joint before therapy is undertaken, to rule out recent or old fracture and primary or metastatic bone diseases. Also, it is well to know if calcification exists in bursae

about the joint. We know, however, that calcareous deposits are frequently present without symptoms.

Our series of patients treated with wide-field body radiation is too small to warrant discussion. Scott, in his monograph, "Wide Field X-ray Treatment," reports excellent results. Our limited experience thus far has not given similar response.

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Acute Central (Hypopyon) Ulcers of the Cornea

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CENTRAL corneal ulcers form a group of ulcers distinct etiologically and clinically from marginal corneal ulcers.[6] In contrast to the latter, which typically are secondary to acute and chronic conjunctivitis, central ulcers are primary in the cornea. The seriousness of the typical (pneumococcic) central ulcer, moreover, is in sharp contrast to the typical benignity of the typical (staphylococcic) marginal ulcer. A further point of difference is that the causal organisms of central ulcers can almost invariably be found in scrapings from the ulcer base while scrapings from marginal ulcers are often disappointing.

The following report summarizes the results of an etiologic and therapeutic study of 50 cases of central ulcer observed by the writer since 1932. They do not constitute a consecutive series since only those cases are included for which records of etiologic determinations were retained and in which therapy was personally administered or supervised.

CLINICAL CHARACTERISTICS

The central ulcers in this series varied in severity from mild, slowly progressing infections, readily amenable to therapy, to the exceptional fulminating infection which, in the matter of a day or two, progressed to destruction of the eye. As will be discussed later in detail, the different etiological types, although indistinguishable on purely clinical grounds, varied considerably in severity.

The typical central ulcer arose most often near the margin of the cornea and then progressed in a band-like process into and across the pupillary area. Hypopyon was a characteristic feature in all but three of the 50 cases and tended to develop early in the disease. Pain was severe in most cases and photophobia was prominent in all but four cases in which the ulcers occurred in insensitive corneas. Conjunctival reaction was usually mild.

Although the ulcers could be considered primary in comparison with typical marginal ulcers, they were in fact invariably secondary to corneal epithelial damage of one sort or another, the most common being that resulting from corneal foreign bodies. Other sources of epithelial damage included rupture of corneal bullae in bullous keratitis, fingernail scratches, and lacerations from branches of trees in agricultural workers. The possibility of an occupational relationship was suggested by the fact that 12 of the 35 pneumococcic ulcers were in coal miners and three of the four pyocyaneus ulcers were in railroad trainmen.

ETIOLOGY

No difficulty was encountered in determining cause in any of the 50 cases. Scrapings from the advancing borders of the ulcers invariably showed the causal bacterium in large numbers, and its final identification was always possible on culture. In sharp contrast to the findings in the series of marginal ulcers previously reported by the writer,[6] there were no cases in which either smear or culture findings were negative. All five of the bacteria found could be recognized in scrapings taken directly from the lesions. Thus an immediate presumptive identification of the infecting organism was always possible—a matter of considerable importance in view of modern antibiotic therapy and chemotherapy.

Table 1 outlines the etiologic findings for the series. In each instance identification of the organism was confirmed in culture. As was to have been expected, the pneumococcus was causal many times more frequently than the other agents. Its nearest competitor was the beta hemolytic streptococcus, with Pseudomonas aeruginosa (pyocyaneus bacillus) next in order and followed by the Diplobacillus of Petit and Klebsiella pneumoniae.

The only difficulty encountered in the identification of the bacteria in culture was in connection with

TABLE 1.—*Bacteriological Findings in 50 Cases of Central Ulcers of the Cornea*

(Organisms identified in smear and culture)	
Diplococcus pneumoniae	35
Streptococcus hemolyticus	6
Pseudomonas aeruginosa	5
Diplobacillus of Petit	3
Klebsiella pneumoniae	1
	50

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